General

Title

Pneumonia mortality: percentage of in-hospital deaths per 1,000 discharges with pneumonia as a principal diagnosis for patients ages 18 years and older.

Source(s)

AHRQ QI research version 5.0. Inpatient quality indicator 20 technical specifications: pneumonia mortality rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 2 p.

National Quality Forum measure information: pneumonia mortality rate (IQI #20). Washington (DC): National Quality Forum (NQF); 2014 Jul 1. 12 p.

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Outcome

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of in-hospital deaths per 1,000 discharges with pneumonia as a principal diagnosis for patients ages 18 years and older.

Rationale

Pneumonia is an important and common reason for hospitalization for which process measures have been established. In addition, inpatient mortality may supplement current 30-day mortality measures to provide a more complete picture of pneumonia related mortality.

This is an outcome measure, and the process-and-outcome link relates to the site-of-care decisions, diagnostic testing and antibiotic treatment, including the time-to-first dose, intravenous-to-oral therapy,

and duration of antibiotic therapy (Mandell et al., 2007). Non-adherence to guidelines has been found to be associated with a higher risk of mortality in patients with severe community acquired pneumonia (Menendez et al., 2002), and there are significant barriers to the optimal adherence to guidelines (Schouten et al., 2007). One important process of care is the choice of antibiotics. Some studies report an association between choice of antibiotics and outcomes for patients hospitalized with community acquired pneumonia (Gleason et al., 1999; Mortensen et al., 2006), although other studies find similar outcomes in alternative approaches (Mortensen et al., 2006; Mills, Oehley, & Arrol, 2005). Another important process of care is the timely administration of any antibiotic to the patient presenting to the hospital with community-acquired pneumonia. Several studies demonstrate an association between the timely delivery of antibiotics and improved outcomes (Barlow et al., 2007; Hsu et al., 2010; Houck et al., 2004; Huang, Hooper, & Marrie, 2006). The association between timely administration and improved outcomes either suggests directly causality, or a correlation with a related, less than optimal, process of care.

Evidence for Rationale

Barlow G, Nathwani D, Williams F, Ogston S, Winter J, Jones M, Slane P, Myers E, Sullivan F, Stevens N, Duffey R, Lowden K, Davey P. Reducing door-to-antibiotic time in community-acquired pneumonia: Controlled before-and-after evaluation and cost-effectiveness analysis. Thorax. 2007 Jan;62(1):67-74. PubMed

Gleason PP, Meehan TP, Fine JM, Galusha DH, Fine MJ. Associations between initial antimicrobial therapy and medical outcomes for hospitalized elderly patients with pneumonia. Arch Intern Med. 1999 Nov 22;159(21):2562-72. PubMed

Houck PM, Bratzler DW, Nsa W, Ma A, Bartlett JG. Timing of antibiotic administration and outcomes for Medicare patients hospitalized with community-acquired pneumonia. Arch Intern Med. 2004 Mar 22;164(6):637-44. PubMed

Hsu DJ, Stone RA, Obrosky DS, Yealy DM, Meehan TP, Fine JM, Graff LG, Fine MJ. Predictors of timely antibiotic administration for patients hospitalized with community-acquired pneumonia from the cluster-randomized EDCAP trial. Am J Med Sci. 2010 Apr;339(4):307-13. PubMed

Huang JQ, Hooper PM, Marrie TJ. Factors associated with length of stay in hospital for suspected community-acquired pneumonia. Can Respir J. 2006 Sep;13(6):317-24. PubMed

Mandell LA, Wunderink RG, Anzueto A, Bartlett JG, Campbell GD, Dean NC, Dowell SF, File TM Jr, Musher DM, Niederman MS, Torres A, Whitney CG. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Infect Dis. 2007 Mar 1;44 Suppl 2:S27-72. [335 references] PubMed

Menendez R, Ferrando D, Valles JM, Vallterra J. Influence of deviation from guidelines on the outcome of community-acquired pneumonia. Chest. 2002 Aug;122(2):612-7. PubMed

Mills GD, Oehley MR, Arrol B. Effectiveness of beta lactam antibiotics compared with antibiotics active against atypical pathogens in non-severe community acquired pneumonia: meta-analysis. BMJ. 2005 Feb 26;330(7489):456. PubMed

Mortensen EM, Restrepo MI, Anzueto A, Pugh J. The impact of empiric antimicrobial therapy with a ÃŸ-lactam and fluoroquinolone on mortality for patients hospitalized with severe pneumonia. Crit Care. 2006;10(1):R8. PubMed

National Quality Forum measure information: pneumonia mortality rate (IQI #20). Washington (DC): National Quality Forum (NQF); 2014 Jul 1. 12 p.

Schouten JA, Hulscher ME, Natsch S, Kullberg BJ, van der Meer JW, Grol RP. Barriers to optimal antibiotic use for community-acquired pneumonia at hospitals: a qualitative study. Qual Saf Health Care. 2007 Apr;16(2):143-9. PubMed

Primary Health Components

Pneumonia; death

Denominator Description

Discharges, for patients ages 18 years and older, with a principal International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code for pneumonia (see the related "Denominator Inclusions/Exclusions" field)

Numerator Description

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

A systematic review of the clinical research literature (e.g., Cochrane Review)

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

In the 2008 Healthcare Cost and Utilization Project (HCUP) State Inpatient Data (SID), there were 866,218 hospital discharges with a principal diagnosis of pneumonia and 36,567 in-hospital deaths, for a rate of 42.2 deaths per 1,000 discharges. Pneumonia, along with influenza, is the eighth leading cause of death in the United States according to the 2007 National Vital Statistics Report (Heron, 2011). Even patients that recover clinically from an episode of pneumonia remain at higher risk for all-cause mortality and cardiovascular mortality (Yende et al., 2011).

Evidence for Additional Information Supporting Need for the Measure

Heron M. Deaths: leading causes for 2007. Natl Vital Stat Rep. 2011 Aug 26;59(8):1-95. PubMed

National Quality Forum measure information: pneumonia mortality rate (IQI #20). Washington (DC): National Quality Forum (NQF); 2014 Jul 1. 12 p.

Yende S, D'Angelo G, Mayr F, Kellum JA, Weissfeld L, Kaynar AM, Young T, Irani K, Angus DC, GenIMS Investigators. Elevated hemostasis markers after pneumonia increases one-year risk of all-cause and cardiovascular deaths. PLoS ONE. 2011;6(8):e22847. PubMed

Extent of Measure Testing

Reliability Testing

Data/Sample. Includes approximately 30 million adult discharges for 4,000 hospitals ("Healthcare Cost and Utilization Project [HCUP] State Inpatient Databases [SID]," 2008).

Analytic Method. The signal to noise ratio is the ratio of the between hospital variance (signal) to the within hospital variance (noise). The formula is signal / (signal + noise). The ratio itself is only a diagnostic for the degree of variance in the risk-adjusted rate systematically associated with the provider. Therefore, what matters is the magnitude of the variance in the "smoothed" rate (that is, the variance in the risk-adjusted rate after the application of the univariate shrinkage estimator based on the signal ratio).

Testing Results. What the data demonstrate is systematic variation in the provider level rate of 19.1 to 58.6 per 1,000 from the 5th to 95th percentile respectively after a signal ratio of 0.694 is applied as the shrinkage estimator (that is, after accounting for variation due to random factors).

Validity Testing

Data/Sample.

> Includes approximately 30 million adult discharges for 4,000 hospitals ("HCUP SID," 2008). California ("HCUP SID," 2005).
> Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample and AHRQ Quality Indicators, modified version of 4.1.

Analytic Method. Validity testing focused on construct validity in three respects. First, whether performance on the pneumonia mortality measure was correlated with performance on related measures of mortality for selected conditions. Second, whether performance on the in-patient pneumonia measures was related to performance on the 30-day measure. Third, data on mortality trends is also presented.

Testing Results. The correlation between the hospital-level pneumonia risk-adjusted mortality rate and the related mortality measures for selected conditions are as follows: 0.3485 (acute myocardial infarction [AMI]); 0.4546 (congestive heart failure [CHF]); 0.3476 (stroke); 0.2873 (gastrointestinal [GI] hemorrhage); 0.2286 (hip fracture).

> Using hospital discharge data linked to death records, of all deaths among pneumonia patients that occurred within 30-days of discharge, 52.2% were in-hospital before 30-days, 4.4% were in-hospital after 30-days, 40.1% were out-of-hospital, and 3.3% were transfers to other acute care hospitals. The correlation in hospital-level rates was 0.755.
> Refer to the original measure documentation for risk-adjusted rates deaths per 1,000 hospital admissions by year.

Refer to the original measure documentation for additional measure testing information.

Evidence for Extent of Measure Testing

Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID). Rockville (MD): Agency for Health Research and Quality (AHRQ); 2005.

Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID). Rockville (MD): Agency for Health Research and Quality (AHRQ); 2008.

National Quality Forum measure information: pneumonia mortality rate (IQI #20). Washington (DC):

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Age greater than or equal to 18 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Making Care Safer
Prevention and Treatment of Leading Causes of Mortality

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Safety

Data Collection for the Measure

Case Finding Period

The time window can be determined by user, but is generally a calendar year.

Note: The volume-outcome relationship is based on volume over a one-year time period.

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Clinical Condition

Institutionalization

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
Discharges, for patients ages 18 years and older, with a principal International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code for pneumonia

Note: Refer to the original measure documentation for ICD-9-CM codes.

Exclusions
Exclude cases:

> Transferring to another short-term hospital (DISP=2)
> Major Diagnostic Categories (MDC) 14 (pregnancy, childbirth, and puerperium)
> With missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator

Exclusions
Unspecified

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Death

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a lower score

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

The predicted value for each case is computed using a hierarchical model (logistic regression with hospital random effect) and covariates for gender, age in years (in 5-year age groups), Major Diagnostic Category (MDC), transfer status, All Patient Refined- Diagnosis Related Group (APR-DRG) and APR-DRG risk-of-mortality subclass. The reference population used in the model is the universe of discharges for states that participate in the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) for the year 2008 (updated annually), a database consisting of 43 states and approximately 30 million adult discharges and 4,000 hospitals. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., hospital). The risk adjusted rate is computed using indirect standardization as the observed rate divided by the expected rate, multiplied by the reference population rate.

Refer to the original measure documentation for the specific covariates used for this measure.

Standard of Comparison

not defined yet

Identifying Information

Original Title

IQI 20: pneumonia mortality rate.

Measure Collection Name

Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

Measure Set Name

Inpatient Quality Indicators

Submitter

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Developer

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Funding Source(s)

Agency for Healthcare Research and Quality (AHRQ)

Composition of the Group that Developed the Measure

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicator (QI) measures are developed by a team of clinical and measurement experts in collaboration with AHRQ. The AHRQ QIs are continually updated as a result of new research evidence and validation efforts, user feedback, guidance from the National Quality Forum (NQF), and general advances in the science of quality measurement.

Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2015 Jan 5

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2015 Mar

Measure Maintenance

Measure is reviewed and updated on a yearly basis

Date of Next Anticipated Revision

Spring 2016 (version 6.0, including International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] and International Classification of Diseases, Tenth Revision, Procedure Coding System [ICD-10-PCS] compatible software)

Measure Status

This is the current release of the measure.

This measure updates a previous version: AHRQ QI. Inpatient quality indicators #20: technical specifications. Pneumonia mortality rate [version 4.4]. Rockville (MD): Agency for Healthcare Research

and Quality (AHRQ); 2012 Mar. 2 p.

Measure Availability

Source available from the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators (QI) Web site [ ].

For more information, contact the AHRQ QI Support Team at E-mail: QIsupport@ahrq.hhs.gov; Phone: 301-427-1949.

Companion Documents

The following are available:

AHRQ quality indicators. Inpatient quality indicators (IQI) parameter estimates [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 42 p. This document is available from the AHRQ Quality Indicators Web site [ ].

AHRQ quality indicators. Inpatient quality indicators benchmark data tables [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 22 p. This document is available from the AHRQ Quality Indicators Web site [ ].

AHRQ quality indicators. Inpatient quality indicators composite measure workgroup. Final report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2008 Mar. various p. This document is available from the AHRQ Quality Indicators Web site [ ].

HCUPnet: a tool for identifying, tracking, and analyzing national hospital statistics. [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); [accessed 2015 Sep 10]. HCUPnet is available from the AHRQ Web site [ ].

NQMC Status

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Production

Source(s)

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